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Annual Report for

CHAIRMANSHIP OF THE NEPTUNE/PLUTO
OUTER PLANETS SCIENCE WORKING GROUP

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(NASA-CR-194625) CHAIRMANSHIP OF
THE NEPTUNE/PLUTO OUTER PLANETS
SCIENCE WORKING GROUP Annual Report
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1.0 Introduction

The Outer Planets Science Working Group (OPSWG) is the NASA Solar System Exploration Division (SSED) scientific steering committee for the Outer Solar System missions. OPSWG consists of 19 members and is chaired by Dr. S. Alan Stern.

This proposal summarizes the FY93 activities of OPSWG, describes a set of objectives for OPSWG in FY94, and outlines the SWG's activities for FY95.

As chair of OPSWG, Dr. Stern will be responsible for: (1) organizing priorities, setting agendas, conducting meetings of the Outer Planets SWG; (2) reporting the results of OPSWG's work to SSED; (3) supporting those activities relating to OPSWG work, such as briefings to the SSES, COMPLEX, and OSS; (4) supporting the JPL/SAIC Pluto study team; and (5) other tasks requested by SSED.

As the Scientific Working Group (SWG) for Jupiter and the planets beyond, OPSWG is the SSED SWG chartered to study and develop mission plans for all missions to the giant planets, Pluto, and other distant objects in the remote outer solar system. In that role, OPSWG is responsible for: (i) defining and prioritizing scientific objectives for missions to these bodies; (ii) defining and documenting the scientific goals and rationale behind such missions; (iii) defining and prioritizing the datasets to be obtained in these missions; (iv) defining and prioritizing measurement objectives for these missions; (v) defining and documenting the scientific rationale for strawman instrument payloads; (vi) defining and prioritizing the scientific requirements for orbital tour and flyby encounter trajectories; (vii) defining cruise science opportunities plan; (viii) providing technical feedback to JPL and SSED on the scientific capabilities of engineering studies for these missions; (ix) providing documentation to SSED concerning the scientific goals, objectives, and rationale for the mission; (x) interfacing with other SSED and OSS committees at the request of SSED's Director or those committee chairs; (xi) providing input to SSED concerning the structure and content of the Announcement of Opportunity for payload and scientific team selection for such missions; and (xii) providing other technical or programmatic inputs concerning outer solar system missions at the request of the Director of SSED.

2.0 OPSWG Activity Report: FY 1993

OPSWG was chartered as an SSED Science Working Group in March 1991. It's FY91 and FY92 activities were summarized in similar reports to this one, which were submitted to SSED.

In 1993, OPSWG held two full-group meetings and one subgroup meeting. The full-group meetings were: (i) January 1993/Boulder, which had the main objective of evaluating the Pluto Fast Flyby Phase A concept for meeting the 1A mission objectives, and (ii) August 1993/Washington D.C., which had the main objectives of evaluating the MEASURE-Jupiter concept, reviewing the FY93 JPL Pluto Fast Flyby (PFF) study, and evaluating the utility of the PFF spacecraft for conducting other outer solar system missions. The sub-group meeting was in July 1993, at Flagstaff, to conduct in depth evaluations of MEASURE-Jupiter and PFF Clone mission concepts.

From these meetings and the work done by OPSWG, we produced the following products in 1993:

- Three post-Meeting letter reports to the Director of SSES (Drs. Huntress, and later Dr. Piotrowski) and SSED's Advanced Study Chief (Dr. Pilcher, and later Mr. Stetson) summarizing the progress and decisions made by the SWG.
- A major presentation to Dr. Piotrowski and staff describing the scientific background and objectives of the PFF mission.
- An updated the Pluto Scientific Mission Objectives Document (SMOD).
- A review article for *EOS* (see attached), and wrote a short article for the SSED newsletter *Discovery* on the PFF.
- A PFF Mission brochure and mission poster, and developed a Pluto science and mission slide set for use in schools, planetariums, and by members of the scientific community.
- An improved set of Pluto-system constants and parameters for the JPL study team.
- A report requested by Dr. Huntress evaluating the expected advances in groundbased and Earth-orbital capabilities for Pluto study between 1995 and 2010. This report also defined needs for datasets which could improve the conduct of the ongoing mission studies and the expected late-1990s Phase C/D development effort.
- A report for publication summarizing all OPSWG Neptune-system mission studies to date; this report also formed the basis of an invited chapter in the University of Arizona Space Science Series volume, *Neptune and Triton*, which will be published in 1994.

The SWG is presently completing:

- A report requested by Dr. Huntress evaluating the potential uses of the PFF spacecraft for other outer solar system missions after Pluto.

In addition to these activities, Dr. Stern also (i) made OPSWG presentations to (i) the January 1993 COMPLEX Meeting; (ii) the February 1993 SSAAC Meeting, the August 1993 SSES meeting, and the September 1993 SSED Planetary Astronomy MOWG meeting; (iii) supported weekly JPL Pluto Team study telecons throughout the year; (iv) provided various technical input to questions from JPL and SAIC study teams; (v) published letters to the editor of *Science* and *Space News* defending the PFF Mission; and (vi) made the following presentations concerning OPSWG mission studies:

- *Pluto and Charon: Hot Results on Cryogenic Worlds. Physics and Astronomy Department Colloquium.* Northwestern University, Evanston, Illinois. November, 1992.
- *Chiron Discovery Mission.* Discovery Program Workshop, San Juan Institute, San Juan Capistrano, California. November, 1992.
- *Pluto: What We Know and How We'll Go.* Physics Department Seminar. Trinity University, San Antonio, Texas. February, 1993.
- *A mission to the Pluto-Charon Binary.* Astrophysics Colloquium. Princeton University, Princeton, New Jersey. April, 1993.
- *Pluto Mission Overview.* NASA Advanced Technology Instrumentation Workshop. Washington, D.C., April, 1993.
- *NASA Mission to The Planet Pluto.* National Public Radio. Interview. 8 June 1993.
- *What's New with Pluto and Charon.* Arizona Public Radio. Interview. 9 July 1993.

3.0 OPSWG FY94 Plan

In FY94 OPSWG's primary goal is to complete the definition of the science goals/measurement objectives, payload definition, and other Phase A work required for the Pluto Flyby mission. As a part of these Pluto mission activities, OPSWG will:

- Review and finalize the IA, IB, and IC Scientific Measurement Objectives for the PFF mission.
- Review and finalize the strawman payload composition for the PFF mission AO.
- Review the results of Advanced Technology Insertion instrument teams for each breadboard payload experiment.
- Review the evolving JPL spacecraft and encounter designs, and provide feedback on these to JPL and SSED with regard to its ability to accomplish the IA scientific objectives described by OPSWG.
- Complete and deliver the PFF mission capabilities study to SSED describing both the scientific usefulness and limitations of the PFF spacecraft for future missions in the outer solar system.
- Produce a Phase A study report summarizing the scientific rationale, scientific objectives, encounter requirements, and strawman payload requirements for the Pluto mission.
- Interact with SSED as required to prepare materials for the anticipated FY94 PFF payload and IDS selection AO.
- Support JPL by providing technical inputs to and critique of the Phase A mission study as required.
- Support SSED in creating promotional materials describing the Pluto mission.
- Provide additional input and reporting to SSED itself, and the SSES and COMPLEX in 1994 at the request of the SSED Division Director or the Advanced Studies Chief.

In addition to its Pluto mission development work, OPSWG is also charged with studying missions to the giant planets and other bodies of the distant outer solar system. As such, we plan to:

- Evaluate and provide feedback to JPL during its major FY94 MEASURE-JUPITER study, and then report at the end of 1994 to SSED on the feasibility and scientific priorities for MEASURE-JUPITER mission in the late 1990s OSS mission queue.

- Evaluate additional mission candidates as requested by SSED.
- Support SSED activities relating to the 1994 OSS-wide strategic planning (“Woods Hole”) effort.

The above-given FY94 plan is subject to modification at the request of SSED.

OPSWG FY94 Full-Group Meeting Plan

Meeting	Date	Location	Milestones
OPSWG8	Feb '94	JPL or ARC 2 Days	Review PFF IA, IB, IC Objectives Review PFF ATI Payload Development Evaluate MEASURE-Jupiter Study Results
OPSWG9	Aug '94	TBD 3 Days	MEASURE-JUPITER Users Workshop Prepare PFF Phase A Report Draft

¹PFF=Pluto Fast Flyby

4.0 OPSWG Outlook: FY 1995

The specific plans for OPSWG in FY95 are obviously less mature than plans for FY94. This is natural, due to the fluid nature of the present studies and the branchpoints they contain. However, several objectives for FY95 are already clear. They are to (i) complete the development of the Pluto mission for new start; (ii) to support that new start with documentation and other activities as requested by SSED; and (iii) to complete the MEASURE-Jupiter study.